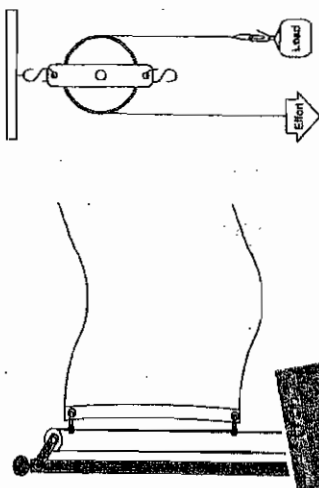


parent signature

A pulley is a wheel that is free to turn on an axle. The wheel is called a sheave, it has a grooved rim that holds a cord or rope. Like the wheel and axle, the pulley is a variation of the lever. It is a circular lever that rotates around its fulcrum.

Pulleys can be fixed or movable. The wheel of a fixed pulley turns, but the pulley itself does not move. It is attached to a bar, beam, or other solid, elevated position. A fixed pulley offers no mechanical advantage. The force you apply is equal to the force of the load. The distance you apply the effort is the same as the distance the load moves. A fixed pulley is useful because it changes the direction of effort. When you pull down on a rope, the load moves up. Many people find pulling down easier than pulling up. People can use their body weight when pulling down to lift a load.

A fixed pulley is bound at the top of a flagpole. The flag is attached to a rope which runs through the pulley and forms a loop. Pulling down on one side causes the other side of the rope to go up. The flag can be raised to the top of the pole and



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What is a pulley?

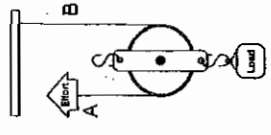
• right there question

lowered again by a person on the ground. Fixed pulleys also raise and lower window blinds and sails on boats.

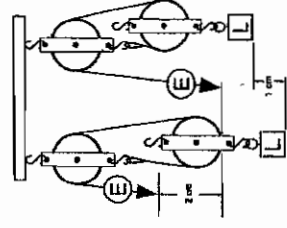
A movable pulley is attached to the load. One end of the rope is attached to a fixed surface high overhead. The other end of the rope goes down, through the pulley attached to the load, and then back up to the top. When you pull up on the other end of the rope, the load moves up. Though the movable pulley does not change the direction of effort, it offers a mechanical advantage. The load is supported by rope on both sides of the pulley. (See A and B in the illustration at right). That means half as much effort is needed to lift the load. You gain effort, but the cost is distance. You must exert effort twice as far as the load moves.

A fixed pulley and a movable pulley can be used together. Connected pulleys make a compound pulley. The rope runs up to the fixed pulley, down and around the movable pulley, and back up to where it is attached to a fixed surface or near the fixed pulley. You gain both a mechanical advantage and a change in the direction of effort when you use this compound pulley. The fixed pulley allows you to pull down to move the load up. The movable pulley halves the effort needed to lift the load. Once again, effort must be exerted twice as far as the load moves.

A compound pulley system is called a block and tackle. The pulleys are blocks because early pulleys were carved from blocks of wood. The rope, cord, or chain used with pulleys is the tackle. The more pulleys there are in a block and tackle, the less effort is needed to raise the load. That's because the added pulleys provide more sections of rope to help support the load.



Using a compound pulley, effort must be applied over 2 centimeters to lift a load 1 centimeter.



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How is a fixed pulley different from a free pulley?

• think and search

Making a Fixed Pulley

What you need
 An empty spool
 A wire coat hanger
 1 meter (3.3 feet) of ribbon wide enough to fit between the spool rims
 A bag with looped handles or a small plastic bucket
 Small object to lift



- What you do**
1. Untwist the wire to separate the two ends of the coat hanger. Be careful when handling the untwisted hanger. The ends can be sharp.
 2. Thread the center of the spool over one end of the wire. Twist the wire back together. The hanger will again be a closed triangle shape, with the spool threaded onto the wire.
 3. Grab the hanger at the two side corners of the triangle. Push the corners toward each other so that the wire begins to form a circle. Move the spool to the section of wire farthest away from the hook.
 4. With the spool opposite the hook, continue to push the sides toward each other. Form the wire into a long, straight loop. Shape the wire so that the spool is held in place but is able to turn freely.
 5. Hook the hanger onto a rod in a closet.
 6. The one end of the ribbon to the bag handles or the handle of the bucket. Slide the other end of the ribbon over the spool.
 7. Place the small objects into the bag or bucket. Now pull down on the free end of the ribbon. You have created a working pulley. Be careful not to let go of the ribbon while you have objects in the bag or bucket. The objects might fall and land on your toes!

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What is a block and tackle?

• right there question

Why will the thread spool coat hanger pulley work?

• in my head

Our goal is to gain knowledge of pulleys through reading. To make a pulley from household materials.

